Understanding Price Elasticity: It's No Stretch!

Lesson by
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Lesson description

An important corollary to the basic economic principles of supply and demand is the notion of price elasticity, or the amount by which demand and supply respond to a change in price. Consumers will generally respond to a higher price for a product by reducing the quantity they buy; they may increase their spending for the same product when prices fall. For suppliers, the price elasticity of demand is particularly critical to understand when considering whether to make price changes. Price increases may not necessarily increase firms' revenues, and a price cut may not bring in new sales. This lesson focuses on the demand side by examining the meaning of elasticity, what factors determine the price elasticity of demand, how price elasticity of demand is measured by a basic formula, and how price elasticity of demand can be measured using the total revenue approach (the lesson uses rubber bands as an illustration). The lesson assumes prior knowledge of the laws of supply and demand.

Concepts

Elasticity
Price elasticity of demand
Total revenue
Law of demand

Objectives

Students will be able to:

1. Define elasticity and price elasticity of demand.

2. Identify the factors influencing the elasticity of demand.

3. Calculate elasticity of demand using a simple formula.

4. Distinguish between elastic and inelastic price elasticity of demand using the total revenue approach.

5. Recognize how elasticity of demand affects business firms.

Related content area
Economics

Time required
60 minutes

Materials

Handout 1: "Gas Alternatives?" (one slip for each student)

Handout 2: "Elasticity Assessment" (one for each student)

Visual 1: "Gallon Converter," to be displayed on an overhead or computer projector

Visual 2: "Price Elasticity of Demand Factors"

Visual 3: "Price Elasticity of Demand Formula"

Visual 4: "Total Revenue Approach to Calculating Price Elasticity of Demand"

Rubber bands, at least four inches long (one for each student)

Internet access (if showing visuals from your computer)

Optional: calculators, one for each student pair

Preparation

Read the lesson description. Prior to conducting the lesson, copy Handout 1: "Gas Alternatives?" You may wish to use card stock or laminate, then cut into strips. Make one copy of Handout 2: "Elasticity Assessment" for each student. Gather rubber bands for each student. Make copies of Visuals 1, 2, 3, and 4 if you will be showing them on an overhead projector.

Procedure

1. To begin the lesson, ask students if they know what the current price of gasoline is per gallon. (Answers will vary, but students who are drivers most likely will be very familiar with the price of gas.) Ask students what they would do if the price of gas were to increase sharply. (Answers will vary, but may include take public transportation, walk, bike, carpool, get a more efficient car, or pay the demanded price because students have to drive to school and/or work.) Remind students that the **Law of Demand** states that when prices rise, the quantity demanded falls (for normal goods).

2. Ask students what they think it would be like if cars ran on water instead of gasoline. (Answers will vary, but students will likely say it would be a lot cheaper and easier.)

3. Tell students that while gasoline is sold by the gallon, many other products that are in liquid form are sold by the ounce, pint, or quart. Allow students to share examples of products that are sold this way. (Answers will vary, but could include soda, milk, bottled water, perfume, dishwashing soap, and so forth.)

4. Tell students that they are going to compare the price of gasoline to other common household items. Distribute one slip from Handout 1 to each student. Distribute calculators if so desired. Display Visual 1 and tell students that they are to calculate the gallon price of their item so that it can be compared to the price of gasoline. (The best way to calculate is to figure the unit price per ounce, then multiply by 128.)

5. Allow students time to calculate, then ask the class if any of their items were cheaper per gallon than gasoline. (None are currently cheaper.) Ask students to volunteer the name of their item and the per gallon price. Make sure that the students who have the slips for milk and nail polish volunteer their answers.

6. Ask students to think again about how they would respond to a change in the price of gas. If they went to the gas station and prices had doubled overnight, what would they do? (Answers will vary, but may include buy it anyway because the gauge is nearly on empty, conserve gas by carpooling or making shorter trips, and so on.)

7. Tell students that when we buy something every day and buy it frequently, we notice the price and any changes to it. Ask students if they would stop buying sports drinks if the price rose from $1.00 to $1.25. (Probably not, since 25 cents is not a large amount, even though it represents a 25 percent price increase.) Students may have heard that a famous coffee chain recently raised the price of many of its drinks by 30 cents per cup. Do you think this affected the company's sales? (Probably not, since 30 cents is not a large amount.) What if gas went to $6 a gallon? (This

increase would likely change buying habits significantly.) Even though nail polish is over $2,000 per gallon, we do not buy it by the gallon. If the price of nail polish increased by 50 cents, most people wouldn't be that affected by it, since it is purchased infrequently and in small amounts.

8. Ask students to imagine they are buying a car for $20,000. Would a 25 percent price increase matter? How about on a $150,000 house? (Yes, since these items are a large part of consumers' incomes.)

9. Tell students that businesses such as the coffee chain, automakers, and home sellers would like to know how consumers will react to price changes so that they can maximize their profits. Some coffee lovers may have decided that coffee was too expensive when the price increased by 30 cents a cup and therefore started making coffee at home, causing the coffee chain to lose sales. Home sellers may want to know if a price cut on their home will bring in more potential buyers. While the law of demand states that when prices rise, the quantity demanded falls, businesses will want to know by how much. The higher price may compensate for lost sales; if not, firms may see their profits decline. By cutting prices during sales, stores may bring in more revenue if they have more customers buying their goods.

10. Let students know that the strength of consumer response to changes in prices is measured by calculating **price elasticity of demand**. **Price elasticity of demand** measures how much quantity demanded changes in response to a change in price. When the response to a price change is large, it is called an **elastic demand.** When responses to price changes are small, demand is designated as **inelastic.**

11. Display Visual 2: "Price Elasticity of Demand Factors." Review each factor and explain the following, encouraging students to share their own examples.

- **Number of substitutes:** The greater the number of substitutes, the more elastic the demand (the bigger the response to a price change). Have students brainstorm items that have few substitutes. (Gasoline, insulin, and electricity may be among the responses.) Goods that have few or no substitutes will have an inelastic demand—consumer response to a price change will be small.
- **Necessity versus luxury:** Goods considered necessities will have a more inelastic demand as opposed to goods considered luxuries. (Of course, this can be relative; coffee drinks are a good example of a good where there may be a difference of opinion on luxury versus necessity—gasoline and electricity are generally considered necessities.) Yachts or designer purses are generally considered luxuries and would have more elastic demand.
- **Definition of the market:** The more broadly defined the market, the more inelastic the demand. There are few substitutes for "food," but there are many for more narrow categories such as meat and even more for a particular type of meat such as steak.

- **Time:** Ask students if they have ever been to the store the night before a school project is due and had to buy supplies at a higher price than they were expecting. Why did they buy the items? (The project was due and students had to complete it.) In a short time frame, consumers have fewer alternatives. If you are buying school supplies a week ahead of the project, you might be able to shop around to find a better price. If the price of gas stays high for an extended period of time, you could take public transportation or a rider service, walk, bike, carpool, or trade in your car for a more efficient model.
- **Percentage of a consumer's income:** A 10-cent price increase for a bottled water or 30-cent price hike for a latte may not matter much to consumers, since the goods don't represent a large percentage of their income. A 10 percent increase on a car, big-screen TV, or a home would represent a much larger portion of income, and therefore consumers would react more to these price changes. The higher the percentage of a consumers' income the good represents, the more elastic the price elasticity of demand.

12. Tell students that all of these factors influence the price elasticity of demand, and there is a formula that can be used to determine if the price elasticity of demand is elastic or inelastic.

13. Display Visual 3: "Price Elasticity of Demand Formula," and review the examples given. Allow students to practice, using the following examples. Remind students that the percentage price change is the denominator, or the number that goes below the fraction. (Students often put the price change in the numerator because it is mentioned first.)
    a. If a price increases by 20 percent and quantity demanded falls by 10 percent, is demand elastic or inelastic? (Take students through the calculation to determine that the answer is 0.5, which is inelastic, since quantity demanded fell by less than price. If elasticity is <1, it is inelastic.)
    b. If a price falls by 10 percent and quantity demanded rises by 15 percent, is demand elastic or inelastic? (Show the calculation and the answer, 1.5. The price is elastic, since the change in quantity demanded was greater than the change in price (a big response). If elasticity is >1, it is categorized as elastic.)

    Tell students that when the percentage change in quantity demanded equals the percentage change in price, this is known as unit elasticity. On a demand curve, inelastic curves are steep and vertical, resembling the letter *I*. Perfectly inelastic demand curves are vertical. Elastic demand curves are flatter, with perfectly elastic curves horizontal.

14. Tell students that they will have a chance to practice with the formula later, but there is another way to determine elasticity, using what is known as the "total revenue" approach.

15. Show students Visual 4: "Total Revenue Approach to Calculating Price Elasticity of Demand," and review the meaning of total revenue with students. Go over each example on the visual.

16. Hand each students a rubber band. Ask them to loop their thumbs on the inside of the rubber band. Have students move their left thumb up to represent a price increase. (Price goes up.) Have students move their right thumb down. (Total revenue goes down.) Is the rubber band stretching? Yes! Price elasticity of demand is elastic.

17. Have students use the rubber band again and move their left thumb down (price goes down), and their right thumb up (total revenue goes up). Is the rubber band stretching? Yes! Price elasticity of demand is elastic.

18. Have students hook their thumbs inside the rubber band again and move their left thumb up (price goes up) and their right thumb up (total revenue goes up). Is the rubber band stretching? No—it is inelastic.

19. Have students hook their thumbs inside the rubber band again and move their left thumb down (price goes down) and right thumb down (total revenue goes down). Is the rubber band stretching? No—it is inelastic.

20. Have students complete Handout 2: "Elasticity Assessment" as a review and assessment.

Visual 1: Gallon Converter

Converting to gallons

1 gallon = 128 ounces

4 quarts = 1 gallon

1 quart = 32 ounces

2 pints = 1 quart

1 pint = 16 ounces

Visual 2: Price Elasticity of Demand Factors

- **Number of substitutes:** The greater the number of substitutes, the more elastic the price elasticity of demand.

- **Necessity versus luxury:** Goods considered necessities will have a more inelastic price elasticity of demand as opposed to goods considered luxuries.

- **Definition of the market**: The more broadly defined the market, the more inelastic the price elasticity of demand.

- **Time:** The shorter the time frame, the more inelastic the price elasticity of demand.

- **Percentage of a consumer's income:** The higher the percentage of a consumer's income the good represents, the more elastic the price elasticity of demand.

Visual 3: Price Elasticity of Demand Formula

Price elasticity of demand measures how much quantity demanded responds to a change in price.

Elastic: Large responses (elasticity coefficient >1)

Inelastic: Small responses (elasticity coefficient <1)

Formula

Price Elasticity of Demand = <u>Percent Change in Quantity Demanded*</u>
Percent Change in Price

Examples

A) Price of gasoline rises by 10 percent, quantity demanded falls by 25 percent

25/10 = 2.5 (elastic)

B) Price of jeans falls by 20 percent, quantity demanded increases by 10 percent

10/20 = 0.5 (inelastic)

C) Price of skateboards increases by 15 percent, quantity demanded falls by 5 percent

5/15 = 0.333 (inelastic)

D) Price of tea falls by 20 percent, quantity demanded increases by 40 percent

40/20 = 2 (elastic)

* If the percent change in quantity demanded equals the percent change in price, this is known as "unit elasticity."

Visual 4: Total Revenue Approach to Calculating Price Elasticity of Demand

Total Revenue = Price of the good or service x quantity sold
If 100 drum sets are sold at $250 each, the total revenue = $250 x 100 = $25,000

Total Revenue and Calculating Elasticity

If Price Elasticity of Demand is Elastic:

- A price increase will cause total revenue to fall
- A price decrease will cause total revenue to rise

If Price Elasticity of Demand is Inelastic:

- A price increase will cause total revenue to rise
- A price decrease will cause total revenue to fall

Examples

Betty's Bakery sells 50 cakes per week for $12 each.
Total Revenue = $12 x 50 = $600

Betty decides to lower the price of her cakes to $10. She sells 12 more cakes a week.
Total Revenues = $10 x 62 = $620

Since the total revenue rose in response to the price change, the price elasticity of demand is elastic.

Greg's Garage performs 75 oil changes a week for $20 each.
Total Revenue = $75 x 20 = $1,500
Greg decided to raise the price of his oil changes to $24. He now performs 65 oil changes a week.
Total revenue = $24 x 65= $1,560
Greg's revenue rose when he increased his price; price elasticity of demand is inelastic.

Handout 1: Alternatives to Gasoline?

20-ounce soda $1.68	20-ounce bottled water $1.58
16-ounce latte $3.68	16-ounce energy drink $1.88
12-ounce brake fluid $3.87	2-ounce contact lens solution $2.88
24-ounce dishwashing liquid $1.97	5-ounce hot pepper sauce $2.84
1/2-gallon milk $2.23	1/2-ounce nail polish $7.94
1-ounce liquid makeup $5.87	8.5-ounce mouthwash $2.34
16-ounce olive oil $4.52	8-ounce body lotion $5.34

Handout 1: Alternatives to Gasoline? (Continued)

8-ounce body spray $6.98	4-ounce spray adhesive $3.97
32-ounce sports drink $1.00	20-ounce baby oil $4.92
40-ounce liquid detergent $5.24	55-ounce household bleach $2.18
28-ounce shampoo $3.98	1 quart motor oil $4.27
9-ounce hot chili sauce $1.76	4-ounce household glue $0.74

Handout 1: Alternatives to Gasoline? (Answer Key)

20-ounce soda $1.68 $10.75/gallon	20-ounce bottled water $1.58 $10.11/gallon
16-ounce latte $3.68 $29.44/gallon	16-ounce energy drink $1.88 $15.04/gallon
12-ounce brake fluid $3.87 $41.28/gallon	2-ounce contact lens solution $2.88 $184.32/gallon
24-ounce dishwashing liquid $1.97 $10.50/gallon	5-ounce hot pepper sauce $2.84 $72.70/gallon
1/2-gallon milk $2.23 $4.46/gallon	1/2-ounce nail polish $7.94 $2032.64/gallon
1-ounce liquid makeup $5.87 $751.36/gallon	8.5-ounce mouthwash $2.34 $35.23/gallon

Handout 1: Alternatives to Gasoline? (Answer Key Continued)

16-ounce olive oil $4.52 $36.16/gallon	8-ounce body lotion $5.34 $85.44/gallon
8-ounce body spray $6.98 $111.68/gallon	4-ounce spray adhesive $3.97 $127.04/gallon
32-ounce sports drink $1.00 $4.00/gallon	20-ounce baby oil $4.92 $31.49/gallon
40-ounce liquid detergent $5.24 $16.77/gallon	55-ounce household bleach $2.18 $5.07/gallon
28-ounce shampoo $3.98 $18.19/gallon	1 quart motor oil $4.27 $17.08/gallon
9-ounce hot chili sauce $1.76 $25.03/gallon	4-ounce household glue $0.74 $23.68/gallon

*Note: These prices were gathered at a big-box discount store in Jacksonville, Florida, in January 2017. Prices in your area and at different stores may vary.

Handout 2: Elasticity Assessment

1. Jim and Jane have opened a new restaurant in town, JJ's Burgers. Their burgers are quite popular, especially the Big Kahuna burger, which was written about in the local weekly newspaper and mentioned by a local entertainment blogger online. Jim tells Jane that since the burger is so popular, they should raise the price to make more money. Given what you know about price elasticity of demand, is Jim correct that a price increase would bring in more money?

2. The Big Kahuna burger sells for $10.00 and 200 are sold each week. What is JJ's total revenue from Big Kahuna burgers?

3. Jim suggests a 10 percent price increase for the Big Kahuna burger, raising the price to $11.00. After the price change, JJ's sells 160 Big Kahuna burgers a week. What is the percentage change in the quantity demanded after the price change?

4. What is the price elasticity of demand for JJ's Big Kahuna? Use the price elasticity formula to determine if the price elasticity is elastic or inelastic.

5. What is JJ's total revenue after the price increase? Using the total revenue approach, is the price elasticity of demand for JJ's Burgers elastic or inelastic? How do you know?

Handout 2: Elasticity Assessment (Answer Key)

1. Jim and Jane have opened a new restaurant in town, JJ's Burgers. Their burgers are quite popular, especially the Big Kahuna burger, which was written about in the local weekly newspaper and mentioned by a local entertainment blogger online. Jim tells Jane that since the burger is so popular, they should raise the price to make more money. Given what you know about price elasticity of demand, is Jim correct that a price increase would bring in more money? *Not necessarily; it depends on the price elasticity of demand. If Jim and Jane lose many customers because of the price change, they could lose money.*

2. The Big Kahuna burger sells for $10.00 and 200 are sold each week. What is JJ's total revenue from Big Kahuna burgers? *$2,000*

3. Jim suggests a 10 percent price increase for the Big Kahuna burger, raising the price to $11.00. After the price change, JJ's sells 160 Big Kahuna burgers a week. What is the percentage change in the quantity demanded after the price change? *20 percent*

4. What is the price elasticity of demand for JJ's Big Kahuna? Use the price elasticity formula to determine if the price elasticity is elastic or inelastic. *20/10 = 2 (Elasticity is >1, so it is elastic.)*

5. What is JJ's total revenue after the price increase? Using the total revenue approach, is the price elasticity of demand for JJ's Burgers elastic or inelastic? How do you know? *$1,760. It is elastic because the price increased and total revenue decreased from $2,000 to $1,760.*